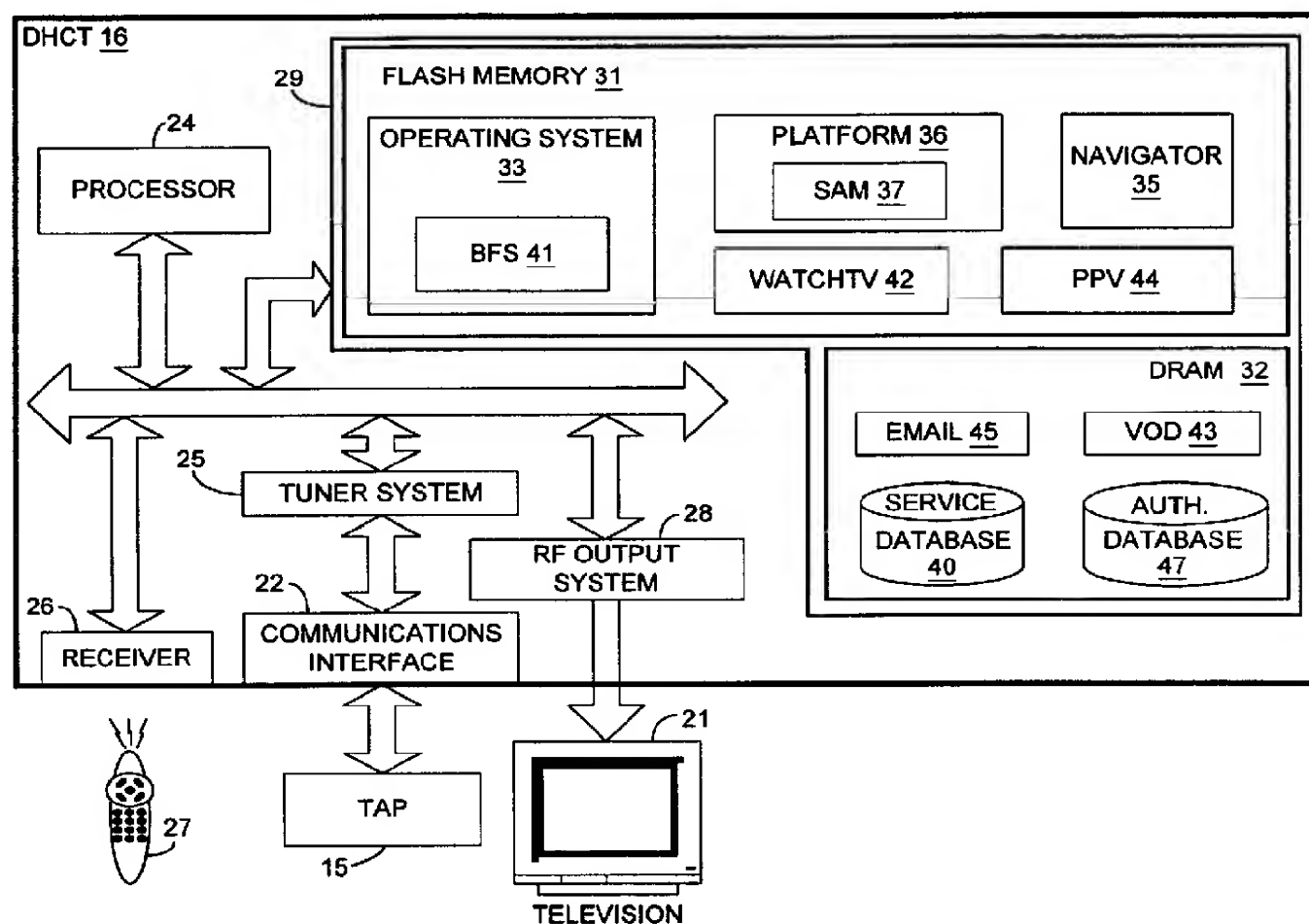




## PCT

**WO 01/76245 A2**



**(57) Abstract:** The present invention provides a system for providing alternative services in a television system. In one implementation, a subscriber is provided an alternative service upon attempting to access an unauthorized service, thereby providing a framework for efficient control of conditional access and enhanced services. In addition, in one implementation, user device limitations or variations are handled conveniently through the same multi-purpose system for providing alternative services.

## SYSTEM FOR PROVIDING ALTERNATIVE SERVICES

### FIELD OF THE INVENTION

This invention relates in general to the field of television systems, and more  
5 particularly, to the field of providing services in television systems.

### BACKGROUND OF THE INVENTION

Historically, television services have been comprised of analog broadcast audio  
and video signals. Cable television systems now receive broadcasts and retransmit them  
10 with other programming to subscribers over land-line networks, typically comprising  
fiber optic cable and/or coaxial cable. With the recent advent of digital transmission  
technology, cable television systems are now capable of providing much more than the  
traditional analog broadcast video. In addition, two-way and advanced one-way  
communications between a subscriber and a cable system headend are now possible.

15 In implementing enhanced programming, the home communication terminal  
("HCT"), otherwise known as the settop box, has become an important computing device  
for accessing video services and navigating a subscriber through a maze of services  
available. In addition to supporting traditional analog broadcast video functionality,  
digital HCTs (or "DHCTs") now also support an increasing number of services which are  
20 not analog, but rather digital; are not basic broadcast, but rather two-way communication  
such as video-on-demand; and are not basic video, such as e-mail or web browsers.  
These are all in addition to the host of other television services which are increasingly  
being demanded by consumers, examples of which include audio and audio/visual  
programming, advanced navigation controls, impulse pay-per-view technology, and on-  
25 line commerce. In addition to the interactive services, the increased bandwidth available

through a digital television system has made it possible for a subscriber to have access to hundreds, or even thousands, of channels and/or services. Thus, in order to provide these more powerful and complex features, the simple conventional channel abstractions need to be extended beyond those which have traditionally been provided.

5           Each HCT or DHCT (collectively hereinafter "DHCT") is typically connected to a cable or satellite television network. The DHCTs generally include hardware and software necessary to provide the functionality of the digital television system at the client's site. Preferably, some of the software executed by a DHCT is downloaded and/or updated via the cable television network. Each DHCT typically includes a processor,  
10       communication components and memory, and is connected to a television or other display device, such as a personal computer. While many conventional DHCTs are stand-alone devices that are externally connected to a television, a DHCT and/or its functionality may be integrated into a television or personal computer, as will be appreciated by those of ordinary skill in the art.

15           Because many separate services may be offered by a single cable television service provider to each individual subscriber, including television viewing channels as well as other applications, there is a need for the DHCT to not only be able to provide each service that the cable television system provider offers but also be able to flexibly control access to services that are denoted as premium services. In addition, certain  
20       television programs can now be broadcast in advanced formats, such as in high definition television (HDTV) format; however, there is currently no mechanism for efficiently handling such advanced formats to effectively integrate them into systems which must also continue supporting older formats.

## SUMMARY OF THE INVENTION

Briefly described, the preferred embodiment of the present invention provides a system for providing alternative services in a television system. In one implementation, a subscriber is provided an alternative service upon attempting to access an unauthorized service, thereby providing a framework for efficient control of conditional access and enhanced services. In addition, in one implementation, user device limitations or variations are handled conveniently through the same multi-purpose system for providing alternative services.

According to one implementation, a client device receives from a server device and stores in client device memory a service database and an authorization database. The service database comprises references to a plurality of services and reference to a plurality of corresponding channels, and said authorization database comprises a list of authorizations individual to said subscriber or DHCT and corresponding to said plurality of services. The client device accesses the service database when the subscriber attempts to access a desired channel to determine a first service corresponding to the desired channel. After learning which service corresponds to the desired channel, the client device then determines whether the subscriber is authorized for that first service according to the authorization database and presents the first service to the subscriber on a display device if the authorization database reveals that the subscriber is authorized for the first service. However, the client device will present an alternative service according to the service database if the subscriber is unauthorized to receive the first service.

In another implementation of the present invention, the client device provides a subscriber an alternative service upon a subscriber's attempt to access a service misconfigured or unsuited for the subscriber's equipment, such as a display device coupled to said client device, or the client device itself. In this embodiment, in addition

to mapping alternative services to certain services in the service database, the service database includes information for each service regarding a required viewing configuration, such as a high definition television format. In much the same way as above, the client device automatically provides the appropriate formatted version of services.

Other objects, features, and advantages of the present invention will become apparent to one with skill in the art upon examination of the following drawings and detailed description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. In the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. 1 is a block diagram of a cable television system in accordance with one preferred embodiment of the present invention.

FIG. 2 is a block diagram of a DHCT with components and applications shown in various memories with related equipment in accordance with the preferred embodiment of present invention depicted in FIG. 1.

FIG. 3 is a diagram of selected components located in the headend and DHCT of the cable television system shown in FIG 1.

FIG. 4 is a diagram of one example of a service and channel mapping scheme stored in memory of the DHCT shown in FIG. 2.

FIG. 5 and 6 comprise a flowchart representation of the alternative service scheme implemented by the DHCT shown in FIG. 2.

FIG.7 is a diagram of another example of an alternative service scheme stored in memory of the DHCT shown in FIG. 2.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5           FIG. 1 is a block diagram of a cable television system 10 including a headend 11 for receiving television signals, such as satellite television signals, and converting the signals into a format for transmitting the signals over the system 10. The transmitted signals can, for example, be radio frequency (RF) signals or optical signals, as shown, transmitted over fiber optic cable 12. When the optical signals are transmitted by the headend 11, one or  
10       more optical nodes 13 are included in the system 10 for converting the optical signals to RF signals that are thereafter routed over other media, such as coaxial cables 14. Taps 15 are provided within the cable system 10 for splitting the RF signal off, via cables 17, to subscriber equipment such as DHCTs 16, cable-ready television sets, video recorders, or computers. Thus, headend 11 is connected through a network 20 to multiple DHCTs 16.

15           FIG. 2 is a block diagram illustrating the DHCT 16 and other system equipment. The DHCT 16 is typically situated within the residence or business of a subscriber. It may be integrated into a device that has a display 21, such as a television set, or it may be a stand-alone unit that couples to an external display 21, such as a display included with a computer or a television, and that processes media transported in television signals for presentation or  
20       playback to a subscriber (user of the DHCT). The DHCT 16 preferably comprises a communications interface 22 for receiving the RF signals, which can include media such as video, audio, graphical and data information, from the tap 15 and for providing any reverse information to the tap 15 for transmission back to the headend 11 (FIG. 1). The DHCT 16 further includes a processor 24 for controlling operations of the DHCT 16, including a video  
25       output port such as an RF output system 28 for driving the display 21, a tuner system 25 for

tuning into a particular television channel to be displayed and for sending and receiving data corresponding to various types of media from the headend 11. The tuner system 25 includes in one implementation, an out-of-band tuner for bi-directional quadrature phase shift keying (QPSK) data communication and a quadrature amplitude modulation (QAM) tuner for receiving television signals. Additionally, DHCT 16 includes a receiver 26 for receiving externally-generated information, such as subscriber inputs or commands for other devices. The DHCT 16 may also include one or more wireless or wired communication interfaces, also called ports, for receiving and/or transmitting data to other devices. For instance, the DHCT may feature USB (Universal Serial Bus), Ethernet (for connection to a computer), IEEE-1394 (for connection to media devices in an entertainment center), serial, and/or parallel ports. The subscriber inputs may, for example, be provided by a computer or transmitter with buttons or keys located either on the exterior of the terminal or by a hand-held remote control device 27 or keyboard that includes subscriber-actuated buttons.

In one implementation, a memory portion 29 of the DHCT 16 includes flash memory 31 and dynamic random access memory (DRAM) 32 for storing the executable programs and related data components of various applications and modules for execution by the DHCT 16. Both the flash memory 31 and the DRAM memory 32 are coupled to the processor 24 for storing configuration data and operational parameters, such as commands that are recognized by the processor 24.

Basic functionality of the DHCT 16 is provided by an operating system 33 that is contained in flash memory 31. One or more programmed software applications, herein referred to as applications, are executed by utilizing the computing resources in the DHCT 16. The application executable program stored in FLASH memory 31 or DRAM memory 32 is executed by processor 24 (e.g., a central processing unit or digital signal processor) under the auspices of the operating system 33. Data required as input by the application

program is stored in DRAM memory 32 and read by processor 24 from DRAM memory 32 as need be during the course of application program execution. Input data may be data stored in DRAM memory 32 by a secondary application or other source, either internal or external to the DHCT 16, or possibly anticipated by the application and thus created with the application program at the time it was generated as a software application program, in which case it is stored in FLASH memory 30. Data may be received via any of the communication ports of the DHCT 16, from the headend 11 via the DHCT's network interface (i.e., the QAM or out-of-band tuners) or as subscriber input via receiver 26. A type of input data fulfills and serves the purpose of parameters as described below. Data generated by an application program is stored in DRAM memory 32 by processor 24 during the course of application program execution.

Availability, location and amount of data generated by a first application for consumption by a secondary application is communicated by messages. Messages are communicated through the services of the operating system, such as interrupt or polling mechanisms or data sharing mechanisms such as semaphores.

The operating system 33 operates a broadcast file system (BFS) client module 41. The BFS client 41 is in constant communication with a similar module on the server side (BFS server 55 in FIG. 3) in the headend 11. This BFS system 41, 55 provides a mechanism for delivering various types of media or data from a group of servers to a client such as the DHCT 16 attached to the network 10. This data can contain practically any type of information. Applications on both the server and the client can access the data via the BFS in a similar manner to a file system found on disk operating systems. The DHCT 16 does not typically have enough memory resources to store all the data that is capable of being broadcast from the BFS server 55. Even if the DHCT 16 could store all the data, there is no guarantee that the DHCT 16 would receive an error-free copy of the data in a single



transmission. In some implementations of a broadcast environment, the DHCT 16 does not request that a server re-send any data that was missed and received in error. Also, since the data is being sent to many similar DHCTs 16, it is prohibitive in some implementations to require that the server re-send missed data to each DHCT 16 that requests it. To ensure that all DHCTs 16 are able to receive an error-free copy of the data, a BFS server 55 (shown in FIG. 3) repeatedly sends the data over a period of time in a cyclical fashion so that the DHCT 16 that is interested in the data may receive it only when it is required. Thus, the BFS client 41 is the module in the DHCT 16 that receives the broadcast from the BFS server 55. Consequently, in some implementations, if the DHCT data has an error, as detected by error detection circuitry or mechanisms in DHCT 16, the BFS client 41 waits for the next broadcast of the data to receive any data that it may need.

The BFS 41, 55 is implemented to appear to applications as a standard hierarchical file system that is common in computer operating systems. The underlying mechanism for transporting files from a headend server 11 to a DHCT 16 relies on a broadcast data carousel mechanism (not shown) that in a preferred embodiment is compliant with the carousel channel specification of the ISO MPEG-2 (Motion Picture Experts Group – Second Standard) entitled Digital Storage Media – Command and Control (DSM-CC). Uniform resource locators (URL) specify “bfs:” as the protocol identity files on the carousel.

Also contained in flash memory 31 is a navigator application 35, which provides a navigation framework for the subscriber to access services available on the cable system. Examples of the services include, in one implementation, watching television and pay-per-view events, listening to digital music, and an interactive program guide, each of which is controlled through separate applications in flash memory 31. The navigator 35 also allows users to access various settings of the DHCT 16, including volume, parental control, VCR commands, etc.

Watch TV 42 and Pay-Per-View (PPV) 44 are resident applications in flash memory

31. Watch TV 42 enables a user to simply “watch television” while PPV 44 enables viewing of premium television services. These applications, because they are in flash memory 31, are always available to the subscriber and do not need to be downloaded each time the DHCT 16 initializes.

The flash memory 31 also contains a platform library 36. The platform library 36 is a collection of functionality useful to applications, such as a Timer Manager, Compression Manager, a HTML Parser, Database Manager, Widget Toolkit, String Managers, and other utilities (not shown). These utilities are accessed by applications as necessary so that each application does not have to contain these utilities thus resulting in memory consumption savings and a consistent user interface.

A Service Application Manager (SAM) provides a model in which the subscriber can access services available on the system. A service consists of an application to run and a parameter, such as data content, specific to that service. The SAM handles the lifecycle of the applications on the system, including the definition, initiation, activation, suspension and deletion of services they provide and the downloading of the application into the DHCT 16 as necessary. Many services can be defined using the same application component, with different parameters. The SAM includes a SAM server 56 (FIG. 3) in headend 11 and a SAM client 37 in the DHCT 16. The SAM client 37 (hereinafter referred to as SAM 37) is a part of the platform 36. As a non-limiting example, an application to tune video programming could be executed with one set of parameters to view HBO and a separate set of parameters to view CNN. Each association of the application component (tune video) and one parameter component (HBO or CNN) represent a particular service that has a unique service ID.

In an alternate embodiment, the same parameter can be invoked by different applications. For instance, HBO can be viewed in a conventional manner or with an application that provides service enhancements for an additional purchase fee. Examples of aggregate functionality included as service enhancements include: the right to record and  
5 save the service to a storage device (a.k.a right to copy); the right to pause, stop, resume play, rewind and fast-forward on a real-time basis when DHCT 16 contains internally or externally a media recording device with storage capabilities (but without the right to keep a permanent copy in storage); and the right to receive the service in superior audio quality such as Dolby AC-3 rather than in stereo. Thus, the SAM 37 provides a subscriber  
10 alternative versions of the same service, each a service enhancement with aggregate functionality. When the subscriber initially activates a service, the SAM 37 attempts to first provide the most-enhanced service to the subscriber before providing a less-enhanced or basic service based on the subscriber's authorization status. A service enhancement is authorized to a subscriber upon the subscriber purchasing the service  
15 enhancement as a subscription or a one-time period (i.e., pay per view) for a purchase fee. If a subscription of the alternate enhanced service is purchased, then each time the authorized subscriber accesses the service, the service is rendered with the authorized aggregated functionality. If the most-enhanced service is not authorized to the subscriber, then the SAM 37 attempts to provide a less-enhanced service or a basic  
20 service. In much the same way as described herein, the client device automatically provides the appropriate version of the enhanced services based on the subscriber's authorization status.

Various application clients can be downloaded into DRAM 32 via the BFS or other means, such as TCP/IP, at the request of the SAM 37. An application client is the portion of  
25 an application that executes on the DHCT 16 and provides the application's services to the

subscriber typically through a graphical user interface. The applications that are stored in the DRAM 32 may be applications that are loaded when the DHCT 16 initializes or are applications that are downloaded to the DHCT 16 upon a subscriber-initiated command using an input device such as the remote 27. In this non-limiting example, as shown in FIG. 2, DRAM 32 contains the following application clients (hereinafter referred to as “application(s)”: a video-on-demand application (VOD) 43, and an e-mail application 45. It should be obvious to one with ordinary skill in the art that these applications are not limiting and merely serve as examples for this present embodiment of the invention.

The applications shown in FIG. 2 and all others provided by the cable system operator are top level software entities on the network for providing services to the subscriber. In one implementation, all applications executing on the DHCT 16 work with the navigator 35 by abiding by several guidelines. First, an application must utilize and implement the SAM 37 for provisioning, activation, and suspension of services. Second, an application must share DHCT 16 resources with other applications and abide by the resource management policies of the SAM 37, the operating system 33, and the DHCT 16. Third, an application must handle all situations where resources are unavailable without navigator 35 intervention. Fourth, when an application loses service authorization while providing a service, an application should suspend the service. The navigator 35 will reactivate an individual service application when it later becomes authorized. Finally, an application must be configured so it does not have access to certain user subscriber input keys that are reserved by the navigator 35 (i.e., power, channel +/-, volume +/-, etc.). However, without any limitations to the aforementioned, in certain circumstances certain applications during the course of program execution may reach a machine-state in which input keys that would ordinarily be reserved may be employed for input by the application but only during that particular machine-state. For instance, an application may display a user interface that

specifically requests input or selection from the subscriber in which one or more of the reserved keys are used momentarily during that machine-state.

FIG. 3 is a diagram of the cable television system of FIG. 1 including selected components located in the headend of the cable television system and a layered view of selected elements in the DHCT. In the implementation shown, the headend 11, includes multiple application servers 51, 51', 51'' that are responsible for provisioning the services provided by the application and for providing the content or data needed by the DHCT 16, which is discussed in more detail below. A series of application servers 51 are connected to a digital network control system 53 via an Ethernet connection 52 such as a 10BaseT or a 100BaseT. An application server manager (not shown) may be included to serve as a registry for all application servers 51 residing on the system headend 11. Through the application server manager graphical user interface (GUI), the GUI for all application servers 51 can be accessed.

The digital network control system (DNCS) 53 provides complete management, monitoring, and control of the network's elements and broadcast services provided to subscribers. The DNCS 53 includes the definitions of sources, digital storage media command and control (DSM-CC) user-to-network configuration of DHCTs in the network and conditional access management. The application server 51 communicates via the Ethernet 52, through an operational system 54, to the SAM server 56 contained on the DNCS 53. The application server 51 defines a particular application to the SAM server 56, and the SAM server 56 instructs the BFS server 55 to add the particular application's executable code and possibly one or more data components related to the service to the carousel (not shown) for distribution to the various DHCTs of the network 10. The SAM server 56 provides various features for each application that directs its execution in the network 20. In preparation to introduce the application, the SAM server 56 also provides a

mapping from the display channel number presented to the subscriber to the service, and vice versa, including the capability to have one service on a channel for a specified time and another service on that channel for a different specified time. The SAM server 56 additionally provides an interface on the SAM server 56 to specify service-related data, and the SAM client 36 on the DHCT 16 provides an interface to access this information efficiently. The SAM server 56 contains information and configuration data whereby applications and services on the DHCT 16 can be activated and suspended remotely by the SAM server 56 by a signaling message.

Continuing with FIG. 3, the DHCT 16 receives the service information from the SAM server 56 when the DHCT 16 is initially powered-up or when an update message is initiated by the headend 11 denoting a change in existing services. Upon receiving the service information, the SAM 37 resident in the DHCT 16 interprets this information and stores it in SAM database 40 (shown in FIG. 2).

FIG. 4 is a diagram of one example of a channel mapping scheme stored in memory of the DHCT 16 shown in FIG. 2. The service information is, in one implementation, a collective term including a channel table 61 and a service table 62. The channel table 61 is a mapping of each channel to which the subscriber may tune the DHCT 16 to the service provided on that channel. The service table 62 is a list of each individual services offered by the cable television system provider as configured by the SAM server 56. Thus, the system operator may configure the channel line-up by setting the various channels in channel table 61 to point 63 to the various services in the service table 62. In this non-limiting example, Channel 1 may be mapped by the SAM server 56 to the ABC service, Channel 2 may be mapped to the CBS service, Channel 3 may be mapped to the NBC service, and so on. Thus, when the subscriber initiates a command via the remote 27 to view channel 1, the navigator 35 accesses the SAM 37 to determine what service corresponds to channel 1. The

SAM 37 accesses the SAM database 40 and determines that channel 1 corresponds to the ABC service and returns that information to the navigator 35. After authorization, as discussed below, the navigator 35 instructs the SAM 37 to activate the ABC service, provided by the watch TV application. Upon receiving that message, the watch TV application uses the operating system 33 to set the tuner system 25 to tune the ABC source specified as the parameter in the ABC service, for rendering the service to the subscriber, in this case the presentation of video and audio on the display 21.

A subscriber is generally able to navigate on any individual channel of all the channels available by the DHCT 16 for viewing the corresponding service mapped to that channel as denoted by the channel mapping table contained in the SAM database 40. However, it is also generally understood that a subscriber may or may not subscribe to each individual service provided or offered by the cable television systems operator. The DHCT 16 contains in DRAM 32 an authorization database 47 containing the authorizations of all services for the subscriber utilizing that specific DHCT 16. The authorization database 47 is periodically updated by the headend 11 to denote any changes in the subscriber's available services.

Authorization information can be specified using the SAM server 56 for each service in the service table. This information can include a conditional access "key" specific to the system that can be delivered to specific DHCTs 16 in a secure manner and processed by a security processor (not shown) and/or conditional access components (not shown) housed in DHCT 16. It also can include an alternate service to use if the given service is not authorized. As an example, the service table 62 contains pointers 64, 65, 66 routing a service to a different service other than the first service so that the second or subsequent service is an alternative to the first service which may be prohibited to an individual subscriber.

With additional reference to FIGS. 5 and 6, the SAM 37 and the navigator 35, in this non-limiting example, implement the service activation using an alternative service scheme 80 in the following manner. If a subscriber attempts to tune the DHCT 16 to channel 9, as in step 82, the subscriber inputs that command to the DHCT 16 via the remote 27. The navigator 35 will eventually receive the input command from the remote and query the SAM 37 to learn what service is linked to channel 9 as requested by the subscriber, as in step 84. The SAM 37 accesses the SAM database 40 to read the channel table 61 to determine which service is referenced to channel 9 in channel table 61, as in step 86. In this example, the SAM 37 reports to the navigator 35, as depicted in step 88, that the service Watch TV + HBO is mapped through pointer 63a to channel 9 in the channel table 61. The navigator 35 next requests of SAM 37, as in step 90, whether the Watch TV + HBO service is authorized to the individual subscriber making the request. The SAM 37, in step 92, accesses the service table 62 to determine, in step 94, if a conditional access or authorization "key" is defined for HBO. If no key is defined for HBO, SAM 37 activates the service, as in step 96. If an authorization key is defined for HBO, SAM 37 uses that "key," as in step 98, to ask the operating system 33 to check the authorization database 47 to determine whether the Watch TV + HBO service is authorized to the subscriber, as depicted in step 100. If, in this non-limiting example, the subscriber is authorized to view Watch TV + HBO, SAM 37 reports this fact to the navigator 35 and the service is activated, as shown in step 102. However, if the subscriber is not authorized for the service (Watch TV + HBO), SAM 37 reports this facts to the navigator as well, as in step 104.

The navigator 35 may then present the subscriber with several options that range from either a denial of service, an opportunity to purchase the service, or a routing to an alternative service (which may include a service offering purchase of the first service).

Traditionally, the simplest solution is to merely present an unauthorized message screen to



the user on channel 9 denoting that the subscriber has not paid or purchased that particular service. The navigator 35 may also be configured to present the subscriber an opportunity to purchase the prohibited service, in this case, HBO, either as a subscription or a one-time fee similar to pay per view by inputting commands through the remote 27 to acknowledge the purchase of the HBO service. Such an opportunity may be provided through a “purchase HBO” service available as an alternative service, as discussed below. In providing the subscriber the opportunity to purchase the prohibited service, the navigator 35 may present descriptive information about the individual service features and functions as a marketing attempt to entice the subscriber to purchase the prohibited service.

As stated above, a service, in an alternate embodiment, may also be provided in one of a multiplicity of alternate service modes, each mode corresponding to an alternate service with aggregate functionality. A subscriber that purchases an enhanced version of the service is authorized to receive the respective enhanced version of the service. A service provided in a multiplicity of alternate service modes can be rendered through SAM 37 with different respective applications for each enhanced version of the service or combinations of different multiple versions of enhancements. Alternatively, a single application can render one or more, or possibly all enhanced versions of the service by querying the subscriber's authorizations as previously described.

Navigator 35 may also automatically use the SAM 37 to activate and present the subscriber an alternative service, as in step 106, for the subscriber to view which may either be a service already in the subscriber's viewing plan or an alternative service that is more economical or currently available as opposed to the prohibited service. Alternatively, an enhanced version of the service may be presented to the subscriber for purchase as either for a subscription fee or a one-time period fee similar to pay per view. Continuing the non-limiting example, when the navigator 35 determines that the Watch TV + HBO service is not

authorized, it queries the SAM 37 to determine if there is an alternate service, as in step 108.

The SAM 37, in step 110, checks its database 40 and determines that the alternative service is the Encore service, as in step 112. In this case the navigator 35 repeats the authorization

query with the SAM 37 for the Encore service, and if it is authorized presents the service by

5 activating it using the SAM 37, as in step 102. The transition from the HBO service via

route 64 may be automatic or transparent to the subscriber, with the possible exception of the

identification that the transition of the services has occurred. However, if the Encore service

is also not authorized, the SAM 37 will report this fact to the navigator 35 after accessing the

authorization database 47, as in step 104. The navigator 35 will then ask for an alternate

10 service to the Encore service, and continue until an authorized alternate service is reported

by the SAM 37 (steps 90-112). Continuing with this non-limiting example, if the subscriber

is not authorized for the Pay-Per-View alternate service (the alternative service to Encore

referenced by pointer 65), the service table may route or may point to a default barker

service via pointer 66 which generally informs the subscriber that channel 9 is not a service

15 option available to that subscriber within his or her viewing plan. If none of the alternate

services are authorized, the navigator 35 will display a default unauthorized service message

to the subscriber, as in step 114. It should be apparent to one of ordinary skill in the art that

the routing of services is not confined to movie services or channels, but rather that the

routing of one service to another may be configured by the system operator at the headend

20 11 so that similar services may be routed from services that are either premium channels or

more desirable services at premium prices.

In an alternative embodiment, the DHCT 16 may be programmed or configured to properly present data to a display 21 configured for high definition television ("HDTV"). A

problem with channel mapping arises with the advent of HDTV for subscribers who may or

25 may not have HDTV viewing capabilities. FIG.7 is a diagram of alternative services where

the alternative services are different viewing formats rather than different services altogether as discussed above.

A subscriber identifies with the navigator 35, using an interactive settings GUI, such as a configuration setting, the type of television set display 21 that is connected to the DHCT 16, such as an HDTV or a standard television ("STV"). In normal operation, SAM 37 is informed of dual or multiple carried services or programs through the service information 61, 62 that identifies the services. Multiple SAM 37 services for the different programming configurations (such as for HDTV and STV) are defined and transmitted throughout the network 20.

In one embodiment, the channel line-up exposed to a subscriber is automatically composed for and limited to the subscriber's display type. The application that displays program data to the subscriber for viewing selection (hereinafter referred to as the interactive program guide (IPG) (not shown) is provisioned to limit display of program data to only those channels compatible to the subscriber's TV format. Thus, the IPG must retrieve from the SAM 37 which channels or programs are available to the subscriber based on the subscriber's TV format. The navigator 35 using the SAM 37 also limits the subscriber to tuning to only those channels that are suitable to the subscriber's display type.

In an alternative embodiment, the navigator 35 allows a subscriber to request display of any channel and the alternate service authorization mechanism described previously is used to activate the service that provides the appropriate format. A conditional access "key" is defined for the HDTV format, and embedded in the service definition for HDTV services. Those services are mapped to the channels. The alternate service for each of the HDTV services is the standard format service. Thus, if a subscriber has an STV display 21 but attempts to tune to an HDTV service, the navigator 35 and SAM 37 use the alternate service mechanism described earlier to ultimately activate the standard service.

FIG.7 is a diagram of an example of channel mapping scheme stored in memory of the DHCT 16 shown in FIG. 2 which depicts routing between HDTV and STV formats. The system operator at the headend 11 may map channels 63 between the channel table 61 and the service table 62 such that some of the services 62 are programmed for HDTV and others are not. The SAM 37 includes a "multiple-feed attribute" bitmap where a "one" value in the bit corresponding to a service indicates a multiple-carried service. A list of pointers 63, organized in sequential order, contain pointers to a service table 62 corresponding to the channels in the channel table 61. The service table 62 may contain information pertaining to the number of feeds, respective source IDs, and respective picture format. As a result, the mapping 63 to the channel table 61 may be such that, in normal operation, the subscriber is otherwise presented viewing of channels that are programmed in HDTV format even though the subscriber's television is not capable of viewing that type of service, which could result in system failure or improper operation. However, if the subscriber configures the DHCT 16 for the type of television set 21 that is connected to the DHCT 16, navigator 35 and SAM 37 will transparently tune to the services of the appropriate format. As a result, each time the subscriber attempts to tune a channel in the channel table 61 that is mapped 63 to a service in the service table 62 which is programmed in HDTV format, the alternative service mapping may automatically route the service from the HDTV format to STV format which the subscriber's display 21 may be able to show.

As a non-limiting example, as shown in FIG.7, if a subscriber desires to watch CNN, which is a multi-carried program, the subscriber may choose to input channel 4 into the remote 27. If the subscriber has pre-configured the DHCT 16 for a STV display device 21 as opposed to an HDTV television device, the navigator 35 will be informed by the SAM 37 that the HDTV service is not authorized. The navigator 35 will then query the SAM 37 for the alternate unauthorized service, which the SAM 37, via pointer 121, will report as the

STV version of CNN. The navigator 35 will query the SAM 37 and determine that the STV CNN service is authorized, and will thus direct the SAM 37 to activate the STV version of CNN so that the display 21 will be able to present the selection to the subscriber.

Conversely, if the subscriber does possess an HDTV display device 21 and has configured the DHCT 16 for presenting HDTV programming, then the navigator 35 will simply activate the HDTV service. If the subscriber wishes to view, for example, ESPN and inputs channel 7 to the DHCT 16, the SAM 37 would automatically route from the service ESPN which is in STV format via the pointer 122 to the ESPN service in HDTV format in a seamless fashion so that the subscriber does not experience delay in the transition.

Some channel attributes are shared for the different formats of a particular service. Thus, service table 62 may include multiple services with the same broadcast logo or same channel station call letters if the services are offered in multiple feeds. Alternatively, different versions of the attributes may be used to indicate different levels of service. Thus, the basic "NBC" call letters may be implemented for the NBC service in STV format while "NBC-HD" may be used to signify the NBC feed in HDTV format.

In still another alternative embodiment, the SAM 37 receives from the SAM server 56 the information required for a watch TV application a service parameter such that any number of display formats and their corresponding sources are identified. For example, a service for CNN may be defined whereby the service application includes a watch TV application that supports multiple feeds and the service parameter would include the multiple sources and a designation of the display type for each source. When activated by the SAM 37, the watch TV application would check the configuration of the DHCT 16 and tune the source corresponding to the supported display 21.

Alternative services, as discussed above, additionally includes modification of services or feeds for presentation of information in different formats or in enhanced formats

from the original feed. As a non-limiting example, if the target channel chosen by the subscriber is a single feed regardless of whether the format is suitable for the subscriber's display 21, a format conversion takes place in the DHCT 16 to scale the picture display to match the subscriber's TV format. Hence, a singly-carried channel or program, regardless of the format, does not prevent reception and display of the program but forces a number of format conversion operations that result in a converted picture.

The DHCT 16 is capable of receiving all MPEG-2 (Motion Picture Experts Group second standard), MP/HL (Main Profile, High Level), and MP/ML (Main Profile, Main Level) formats to decode any of these compressed digital video signals but maybe limited to produce a single video format as its output. The DHCT 16 performs any and all conversion operations necessary to display video on a single TV set configured, for example, as a STV. Thus, a service formatted for HDTV would be converted to STV format if it was a single feed so that the subscriber could view the service. Likewise, STV formatted services could be converted to HDTV format for subscribers with HDTV displays 21. The result is that the DHCT 16 presents the highest quality image available to the display coupled to the DHCT 16 as determined by the configuration set by the subscriber.

Other subscriber equipment can also cause alternative services to be implemented for reasons in addition to unauthorization or HDTV/STV as discussed above. As a non-limiting example, different models of DHCTs in the network 20 may render execution of certain applications unavailable for a variety of reasons. For example, the processor 24 in an older model DHCT 16 may operate too slowly to execute a new application, so the older model DHCT 16 would implement an alternative service referenced by the new application. In this example, the alternative service would be compatible to the capabilities of the older model DHCT 16 with the slower processor 24. Other subscriber equipment such as video cassette recorders and certain types of television sets 21 may place technical restrictions on the type

of applications that the DHCT 16 may execute and thereby require implementation for alternative services compatible to a subscriber's equipment. It should be obvious to one of ordinary skill that alternative services can be implemented by the DHCT 16 for various reasons, and not just for the few examples as described above.

5           The alternative service program, which comprises an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system,  
10           apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or  
15           semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable read-only memory (EPROM or  
20           Flash memory) (magnetic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if  
25           necessary, and then stored in a computer memory. Furthermore, any process descriptions

or blocks in flow charts should be understood as representing modules, segments, or portions of code which include one or more executable instructions for implementing specific logical functions or steps in the process, and alternate implementations are included within the scope of the preferred embodiment of the present invention in which  
5 functions may be executed out of order from that shown or discussed, including substantially concurrently or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present invention.

It should be emphasized that the above-described embodiments of the present invention, particularly any "preferred embodiments" are merely possible examples of the  
10 implementations, merely set forth for a clear understanding of the principles of the invention. Any variations and modifications may be made to the above-described embodiments of the invention without departing substantially from the spirit of the principles of the invention. All such modifications and variations are intended to be included herein within the scope of the disclosure and present invention and protected by the following claims.



## CLAIMS

1. A method for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service upon accessing an  
5 unauthorized service, comprising the steps of:

receiving from the server device and storing in the memory a service  
database and an authorization database, wherein the service database includes a  
channel table referencing a plurality of services corresponding to a plurality of  
channels and a service table defining the plurality of services and including the  
10 definition of alternate services for each service, and wherein the authorization  
database includes a list of authorizations individual to the subscriber and  
corresponding to the plurality of services;

accessing the service database responsive to the subscriber attempting to  
access a desired channel to determine a first service corresponding to the desired  
15 channel;

determining whether the subscriber is authorized for the first service  
according to the authorization database, wherein the client device presents the first  
service to the subscriber on a display device responsive to the authorization  
database revealing that the subscriber is authorized for the first service; and

20 presenting an alternative service according to the service database  
responsive to the subscriber being unauthorized to receive the first service.

2. The method of claim 1, further comprising the step of:  
instructing a service application manager client in the client device to  
receive the service database and the authorization database from the server device.

5

3. The method of claim 2, further comprising the step of:  
instructing a navigation module in the client device to receive the desired  
channel request, wherein the navigation module polls the service application  
manager client to determine the first service that corresponds to the desired  
channel.

10

4. The method of claim 3, further comprising the step of:  
instructing the service application manager client to access the service  
database, wherein the service application manager client communicates to the  
navigation module the first service corresponding to the desired channel.

15

5. The method of claim 4, further comprising the step of:  
instructing the navigation module to poll the service application manager  
client to determine whether the subscriber is authorized to receive the first service.

20

6. The method of claim 5, further comprising the step of:

instructing the service application manager client to access the authorization database contained on the service application manager database, wherein the service application manager client communicates to the navigation module an authorization status for the subscriber corresponding to the first service.

7. The method of claim 6, further comprising the step of:

instructing the navigation module to present the first service on the display device if the authorization status denotes that the subscriber is authorized to receive the first service.

8. The method of claim 6, further comprising the step of:

instructing the navigation module to poll the service application manager client to determine the alternative service to the first service if the authorization status denotes that the subscriber is not authorized to receive the first service.

9. The method of claim 6, wherein the navigation module presents the

alternative service on the display device if the service application manager client communicates to the navigation module that the alternative service is authorized for the subscriber.

10. The method of claim 1, wherein the first service is an enhanced version of a basic service, and wherein the enhanced version includes a one or more functions not provided by the basic service.

5 11. The method of claim 10, wherein one of the functions of the enhanced version of the basic service is an ability to record and save the first service in the memory.

12. The method of claim 10, wherein one of the functions of the enhanced version of the basic service is an ability to pause, stop, resume, replay, rewind, and fast-  
10 forward the first service on a real-time basis.

13. The method of claim 10, wherein one of the functions of the enhanced version of the basic service is an ability to present the first service with a superior audio quality.

15 14. A system for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service upon accessing an unauthorized service, comprising:

logic configured to receive from said server device and store in said  
20 memory a service database and an authorization database, wherein said service database includes a channel table referencing a plurality of services corresponding to a plurality of channels and a service table defining said plurality of services and including the definition of alternate services for each service, and wherein said authorization database includes a list of authorizations individual to said  
25 subscriber and corresponding to said plurality of services;

logic configured to access said service database responsive to said subscriber attempting to access a desired channel to determine a first service corresponding to said desired channel;

logic configured to determine whether said subscriber is authorized for said first service according to said authorization database, wherein said client device presents said first service to said subscriber on a display device responsive to said authorization database revealing that said subscriber is authorized for said first service; and

logic configured to present an alternative service according to said service database responsive to said subscriber being unauthorized to receive said first service.

15. The system of claim 14, further comprising:

logic configured to implement a service application manager client in said client device to receive said service database and said authorization database from said server device.

16. The system of claim 15, further comprising:

logic configured to implement a navigation module in said client device to receive said desired channel request, wherein said navigation module polls said service application manager client to determine said first service that corresponds to said desired channel.

17. The system of claim 16, further comprising:

logic configured to implement said service application manager client to access said service database contained on said service database, wherein said service application manager client communicates to said navigation module said first service corresponding to said desired channel.

18. The system of claim 17, further comprising:

logic configured to implement said navigation module to poll said service application manager client to determine whether said subscriber is authorized to receive said first service.

19. The system of claim 18, further comprising:

logic configured to implement said service application manager client to access said authorization database contained on said service application manager database, wherein said service application manager client communicates to said navigation module an authorization status for said subscriber corresponding to said first service.

20. The system of claim 19, further comprising:

logic configured to implement said navigation module to present said first service on said display device if said authorization status denotes that said subscriber is authorized to receive said first service.

21. The system of claim 19, further comprising:

logic configured to implement said navigation module to poll said service application manager client to determine said alternative service to said first service if said authorization status denotes that said subscriber is not authorized to receive said first service.

22. The system of claim 19, wherein said navigation module presents said

alternative service on said display device if said service application manager client communicates to said navigation module that said alternative service is authorized for said subscriber.

23. The system of claim 14, wherein the first service is an enhanced version of a basic service, and wherein the enhanced version includes a one or more functions not provided by the basic service.

24. The system of claim 23, wherein one of the functions of the enhanced version of the basic service is an ability to record and save the first service in the memory.

25. The system of claim 23, wherein one of the functions of the enhanced version of the basic service is an ability to pause, stop, resume, replay, rewind, and fast-forward the first service on a real-time basis.

26. The system of claim 23, wherein one of the functions of the enhanced version of the basic service is an ability to present the first service with a superior audio quality.

27. A method for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service upon accessing a service misconfigured for a display device coupled to the client device, comprising the steps of:

receiving from the server device and storing in the memory a service  
5 database that includes a channel table and a service table, wherein the channel table references a plurality of services in the service table, corresponding to a plurality of channels;

accessing the service database responsive to the subscriber attempting to  
access a desired channel to determine a first service corresponding to the desired  
10 channel;

presenting the first service on the display device if the client device  
determines that the first service matches a configuration in the client device of a  
type of display device coupled to the client device; and

presenting an alternative service referenced by the first service in the  
15 service database according a determination that the first service determined is incompatible to the configuration in the client device of the type of the display device.

28. The method of claim 27, wherein the display device is configured in a high  
20 definition television (HDTV) format so that the client device is configured to present a television service in HDTV format if available and in a standard format if HDTV format is unavailable.



29. The method of claim 27, further comprising the step of:  
instructing a service application manager client in the client device to  
receive the service database from the server device.

5 30. The method of claim 29, further comprising the step of:  
instructing a navigation module in the client device to receive the desired  
channel request, wherein the navigation module polls the service application  
manager client to determine the first service that corresponds to the desired  
channel.

10 31. The method of claim 30, further comprising the step of:  
instructing the service application manager client to access the service  
database, wherein the service application manager client communicates to the  
navigation module the first service corresponding to the desired channel.

15 32. The method of claim 31, further comprising the steps of:  
instructing the navigation module to poll the service application manager  
client to determine the viewing configuration corresponding to the first service;  
and

20 instructing the service application manager client to access the service  
database, wherein the service application manager client communicates to the  
navigation module the viewing configuration corresponding to the first service.

33. The method of claim 32, further comprising the step of:

instructing the navigation module to present the first service on the display device if the viewing configuration corresponding to the first service matches the viewing configuration of the display device.

5

34. The method of claim 32, further comprising the step of:

instructing the navigation module to poll the service application manager client to determine the alternative service to the first service if the viewing configuration corresponding to the first service does not match the viewing configuration of the display device, wherein the navigation module presents the alternative service on the display device if the service application manager client communicates to the navigation module that the viewing configuration corresponding to the alternative service matches the viewing configuration of the display device.

10

15

35. A system for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service upon accessing a service misconfigured for a display device coupled to said client device, comprising:

logic configured to receive from the server device and store in the memory a service database that includes a channel table and a service table, wherein the channel table references a plurality of services in the service table corresponding to a plurality of channels;

20

logic configured to access said service database responsive to said subscriber attempting to access a desired channel to determine a first service corresponding to said desired channel;

25

logic configured to present said first service on said display device if said client device determines that said first service matches a configuration in said client device of a type of display device coupled to said client device; and

logic configured to present an alternative service referenced by said first service in said service database according a determination that said first service determined is incompatible to said configuration in said client device of the type of said display device.

36. The system of claim 35, wherein said display device is configured in a high definition television (HDTV) format so that said client device is configured to present a television service in HDTV format if available and in a standard format if HDTV format is unavailable.

37. The system of claim 35, further comprising:

logic configured to implement a service application manager client in said client device to receive said service database from said server device.

38. The system of claim 37, further comprising:

logic configured to implement a navigation module in said client device to receive said desired channel request, wherein said navigation module polls said service application manager client to determine said first service that corresponds to said desired channel.

39. The system of claim 38, further comprising:

logic configured to implement said service application manager client to access said service database contained on said service application manager database, wherein said service application manager client communicates to said navigation module said first service corresponding to said desired channel.

40. The system of claim 39, further comprising:

logic configured to implement said navigation module to poll said service application manager client to determine said viewing configuration corresponding to said first service; and

logic configured to implement said service application manager client to access said service database, wherein said service application manager client communicates to said navigation module said viewing configuration corresponding to said first service.

41. The system of claim 40, further comprising:

logic configured to implement said navigation module to present said first service on said display device if said viewing configuration corresponding to said first service matches said viewing configuration of said display device.

42. The system of claim 40, further comprising:

logic configured to implement said navigation module to poll said service application manager client to determine said alternative service to said first service if said viewing configuration corresponding to said first service does not match said viewing configuration of said display device, wherein said navigation

module presents said alternative service on said display device if said service application manager client communicates to said navigation module that said viewing configuration corresponding to said alternative service matches said viewing configuration of said display device.

5

43. A system for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service to a first service, comprising:

10

logic configured to receive a subscriber initiated command to present a first service on said display device;

logic configured to determine if said first service is to be displayed for the subscriber;

logic configured to display the first service responsive to it being determined that the first service is to be displayed for the subscriber; and

15

logic configured to display an alternative service referenced by the first service responsive to it being determined that the first service is not to be displayed for the subscriber.

20

44. The system of claim 43, wherein the logic configured to determine if said first service is to be displayed for the subscriber also determines whether said first service is configured for a display device coupled to the client device according to a configuration of said display device stored by said client device.

25

45. The system of claim 44, wherein the logic configured to determine if said first service is to be displayed for the subscriber also determines said first service is

authorized for said subscriber according to an authorization database received by said client device from said server device.

46. The system of claim 45, wherein a service database downloaded from the server device is used to determine if said first service is to be displayed for the subscriber.

47. A method for a client device with a processor and memory that is coupled to a server device to provide a subscriber an alternative service to a first service, comprising:

receiving a subscriber initiated command to present a first service on said display device;

determining if said first service is to be displayed for the subscriber;

displaying the first service responsive to it being determined that the first service is to be displayed for the subscriber; and

displaying an alternative service referenced by the first service responsive to it being determined that the first service is not to be displayed for the subscriber.

48. The method of claim 47, wherein the logic configured to determine if said first service is to be displayed for the subscriber also determines whether said first service is configured for a display device coupled to the client device according to a configuration of said display device stored by said client device.

49. The method of claim 48, wherein the logic configured to determine if said first service is to be displayed for the subscriber also determines said first service is

authorized for said subscriber according to an authorization database received by said client device from said server device.

50. The method of claim 49, wherein a service database downloaded from the server device is used to determine if said first service is to be displayed for the subscriber.

51. A method for a server device coupled to a network of a plurality of subscriber devices to substantially simultaneously provide multiple feeds of similar programming in different formats, the method comprising:

10           creating a service database including reference to a plurality of channels corresponding to a plurality of services, wherein the plurality of services references the multiple feeds of similar programming in different formats; and  
              sending the service database from the server device to the plurality of subscriber devices.

52. The method of claim 51, wherein one feed of multiple feeds of similar programming in different formats is in a high definition television format.

53. A system for a server device coupled to a network of a plurality of subscriber devices to substantially simultaneously provide multiple feeds of similar programming in different formats, the system comprising:

20           a service database referencing a plurality of channels corresponding to a plurality of services, wherein the plurality of services references the multiple feeds of similar programming in different formats; and

logic configured to send the service database from the server device to the plurality of subscriber devices.

54. The system of claim 53, wherein one feed of multiple feeds of similar programming in different formats is in a high definition television format.



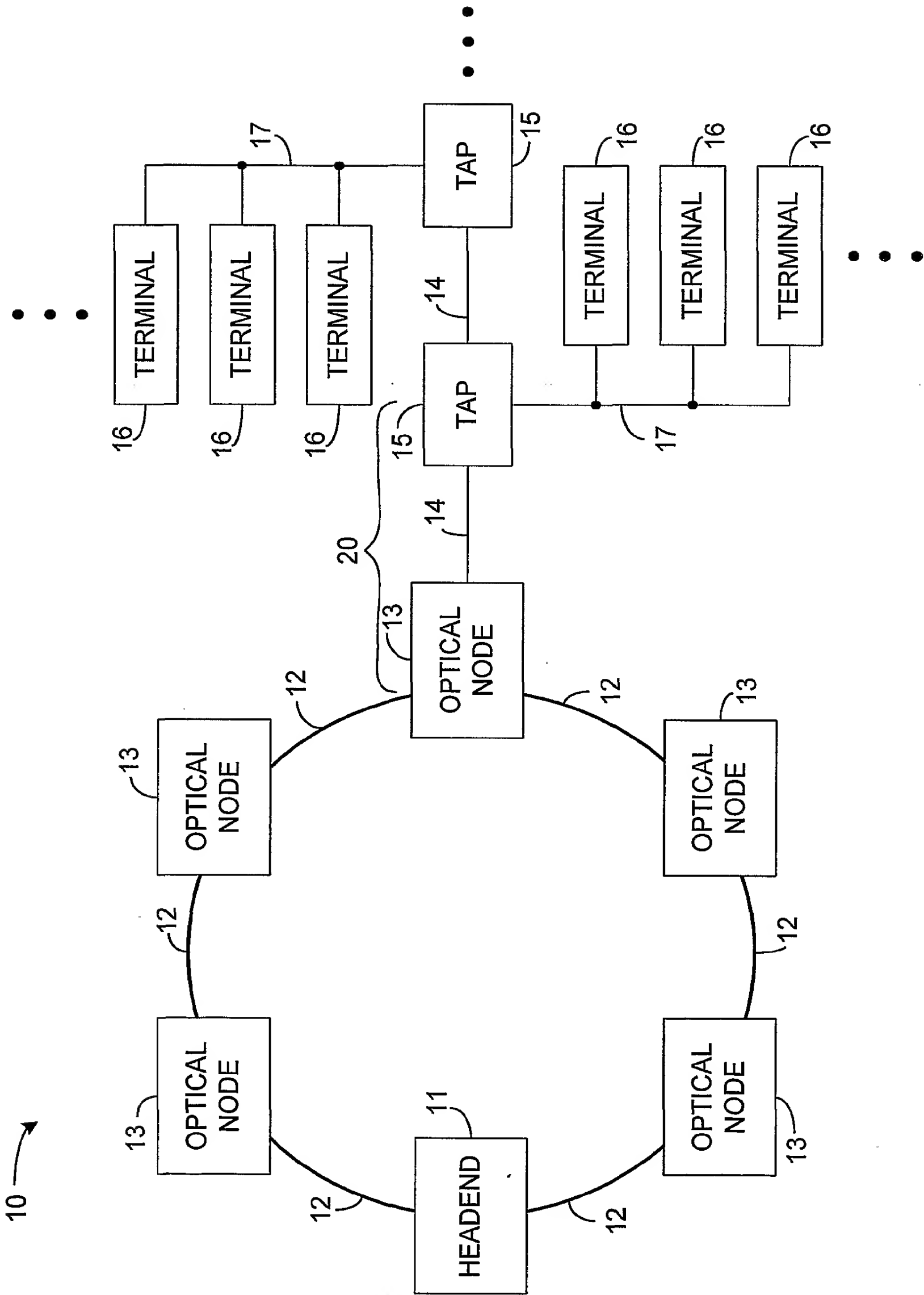


FIG. 1

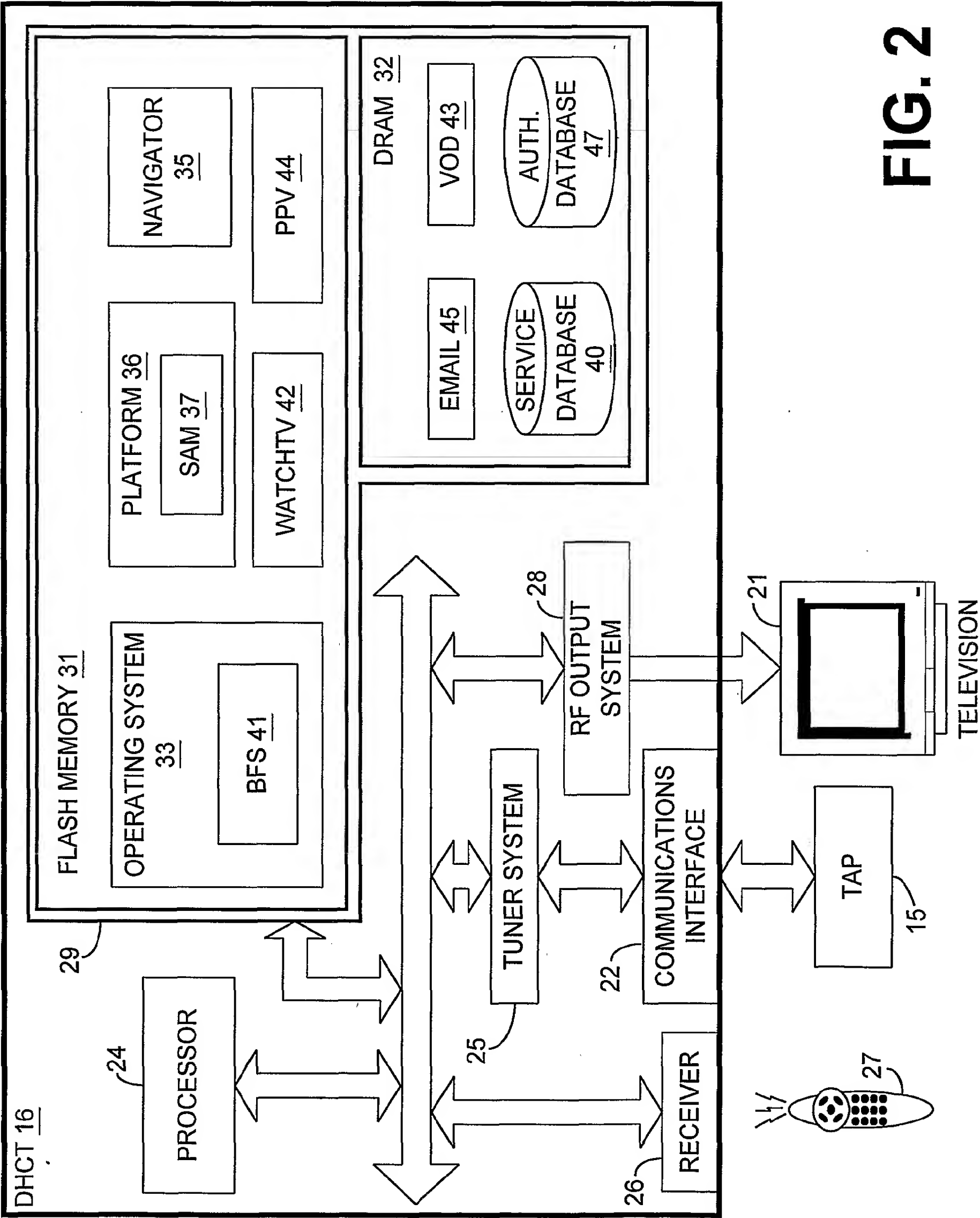


FIG. 2

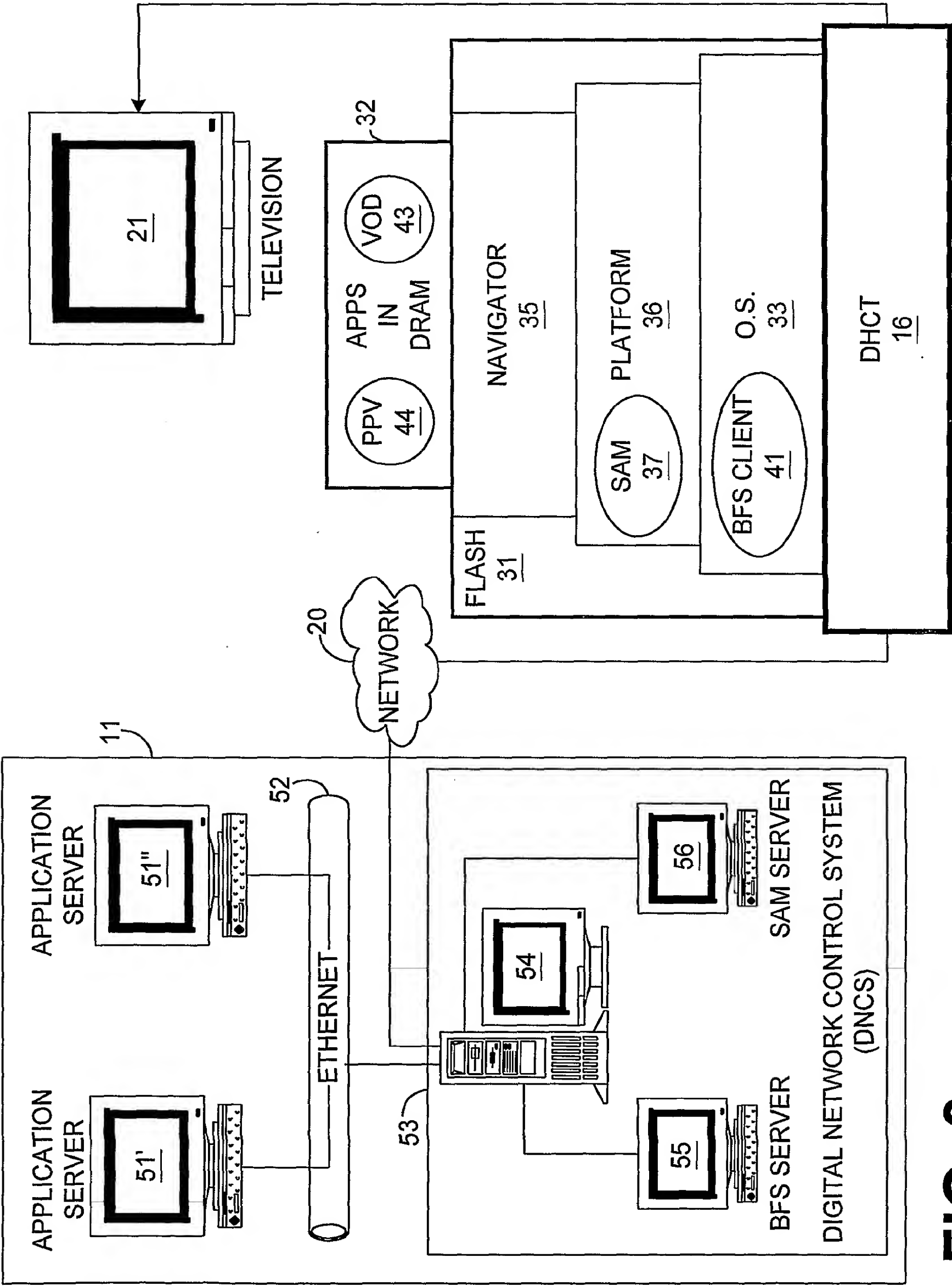
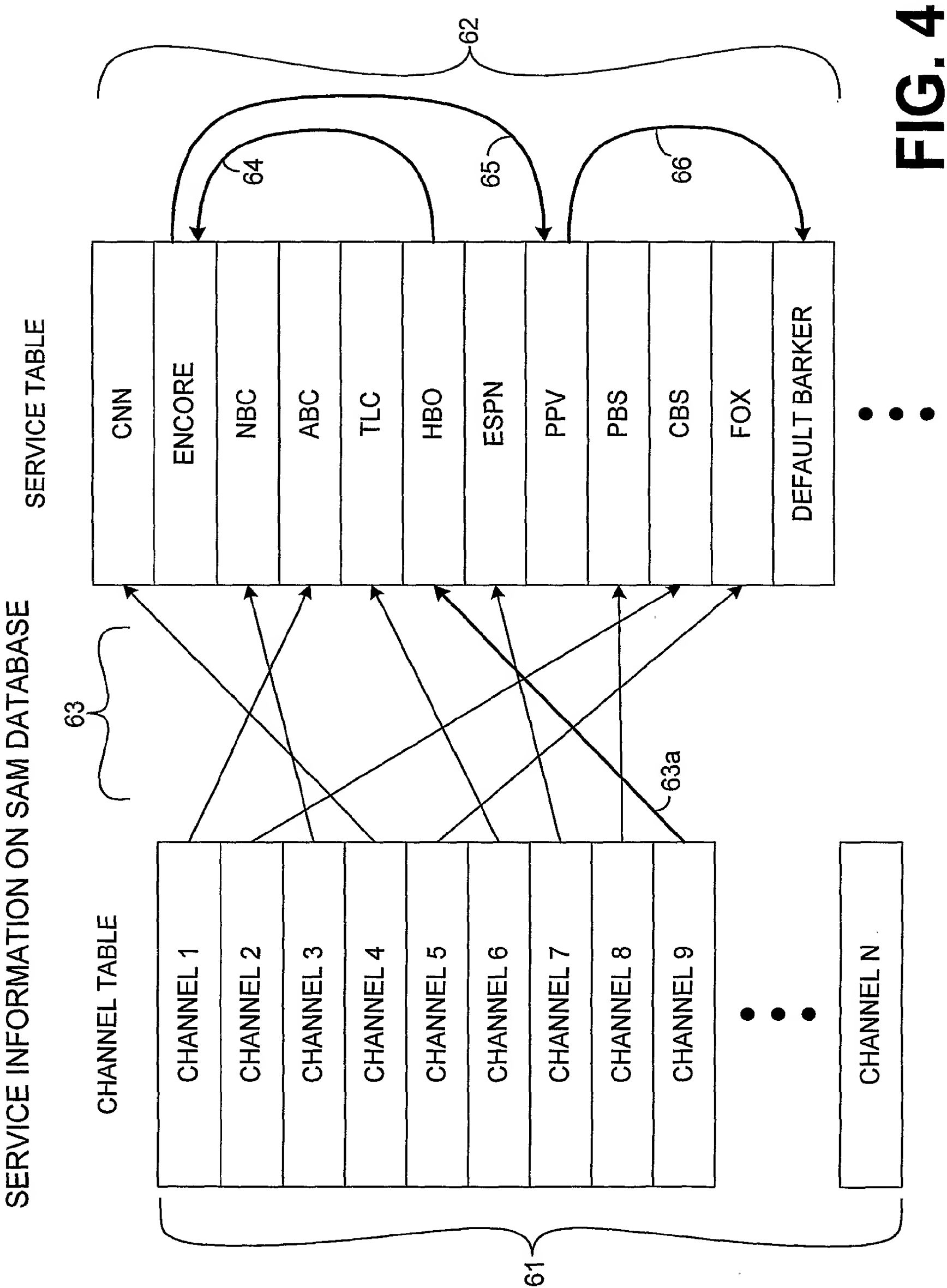
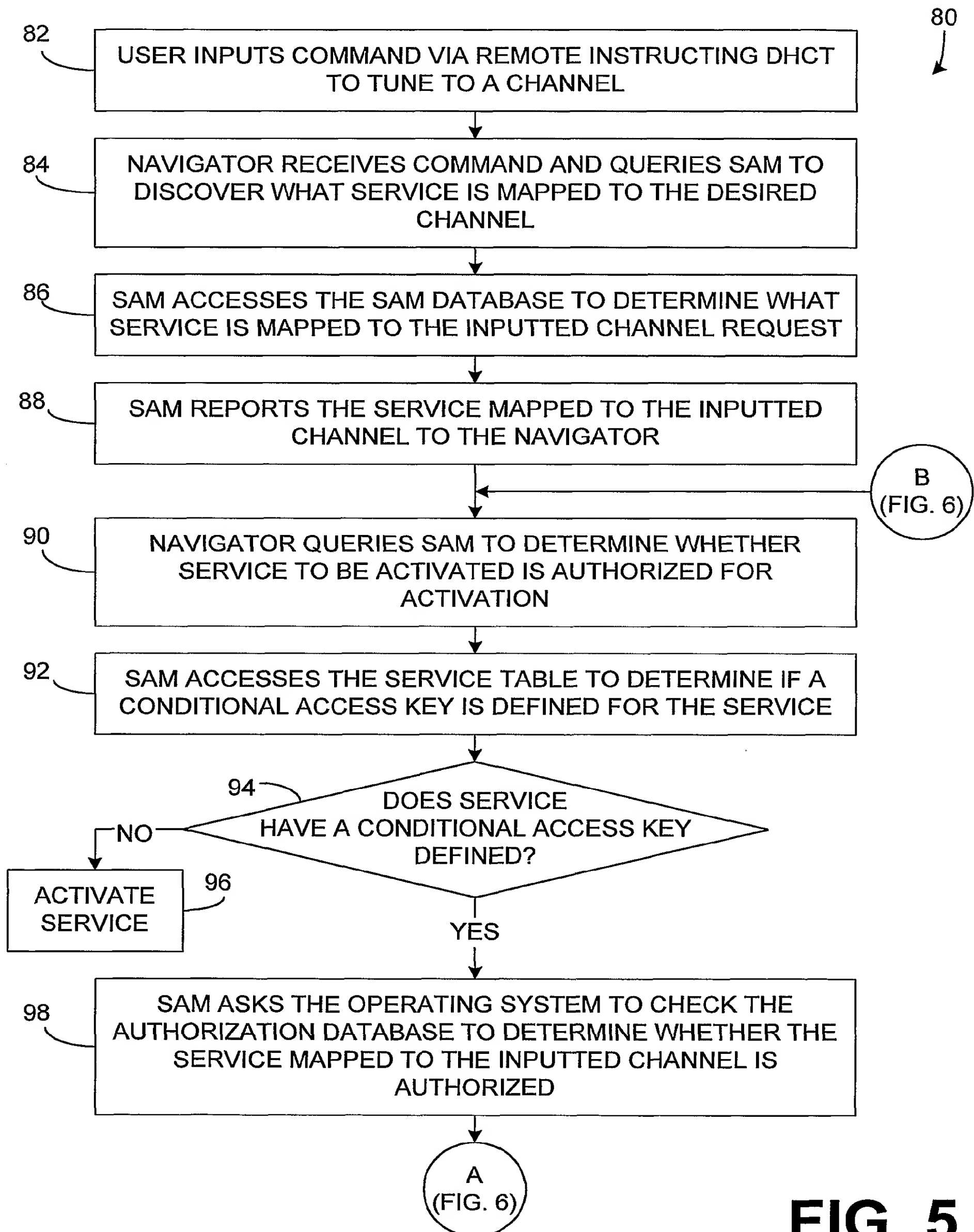


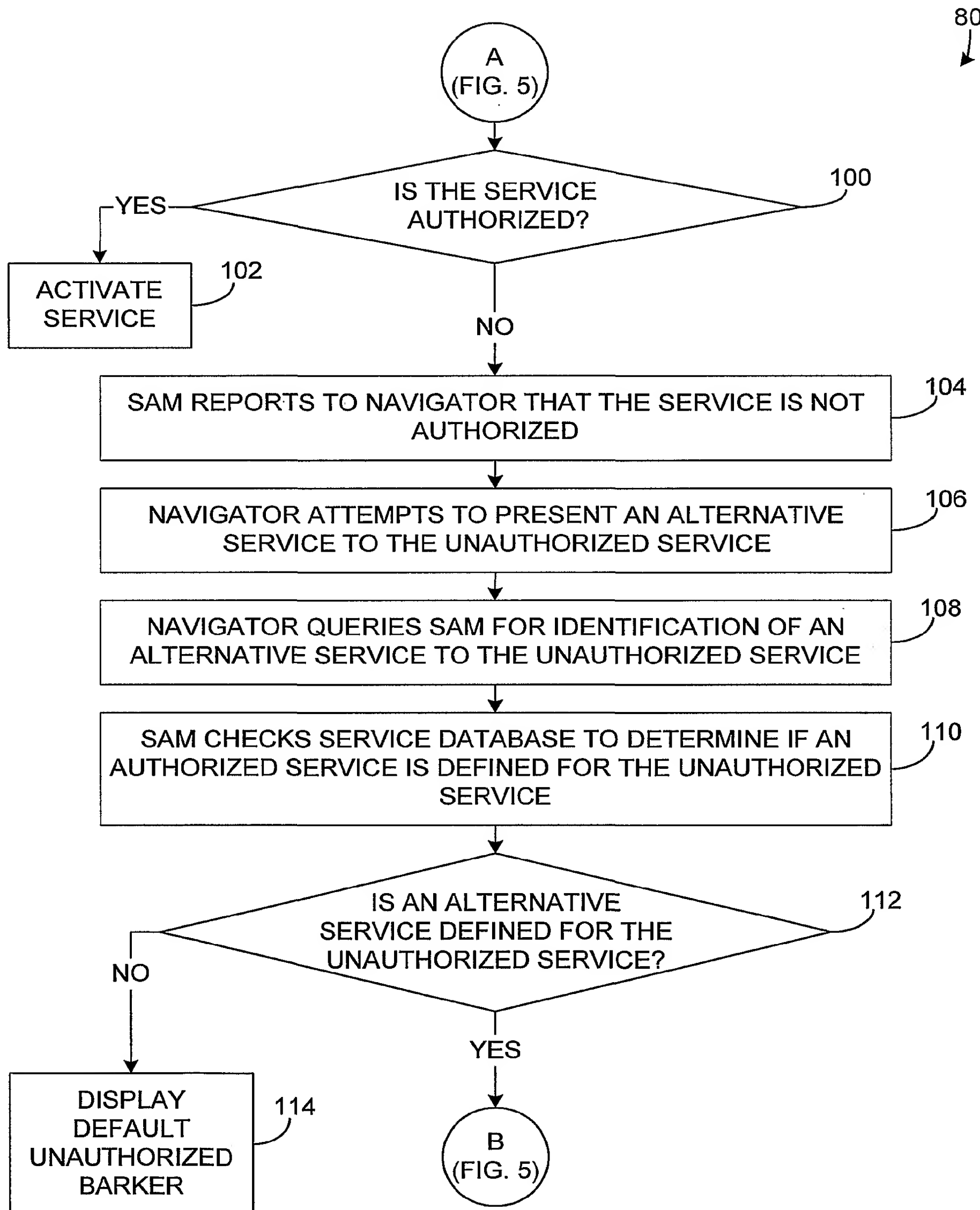
FIG. 3



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**FIG. 5**

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**FIG. 6**

SERVICE INFORMATION FOR HDTV/NON-HDTV SERVICES

SERVICE TABLE

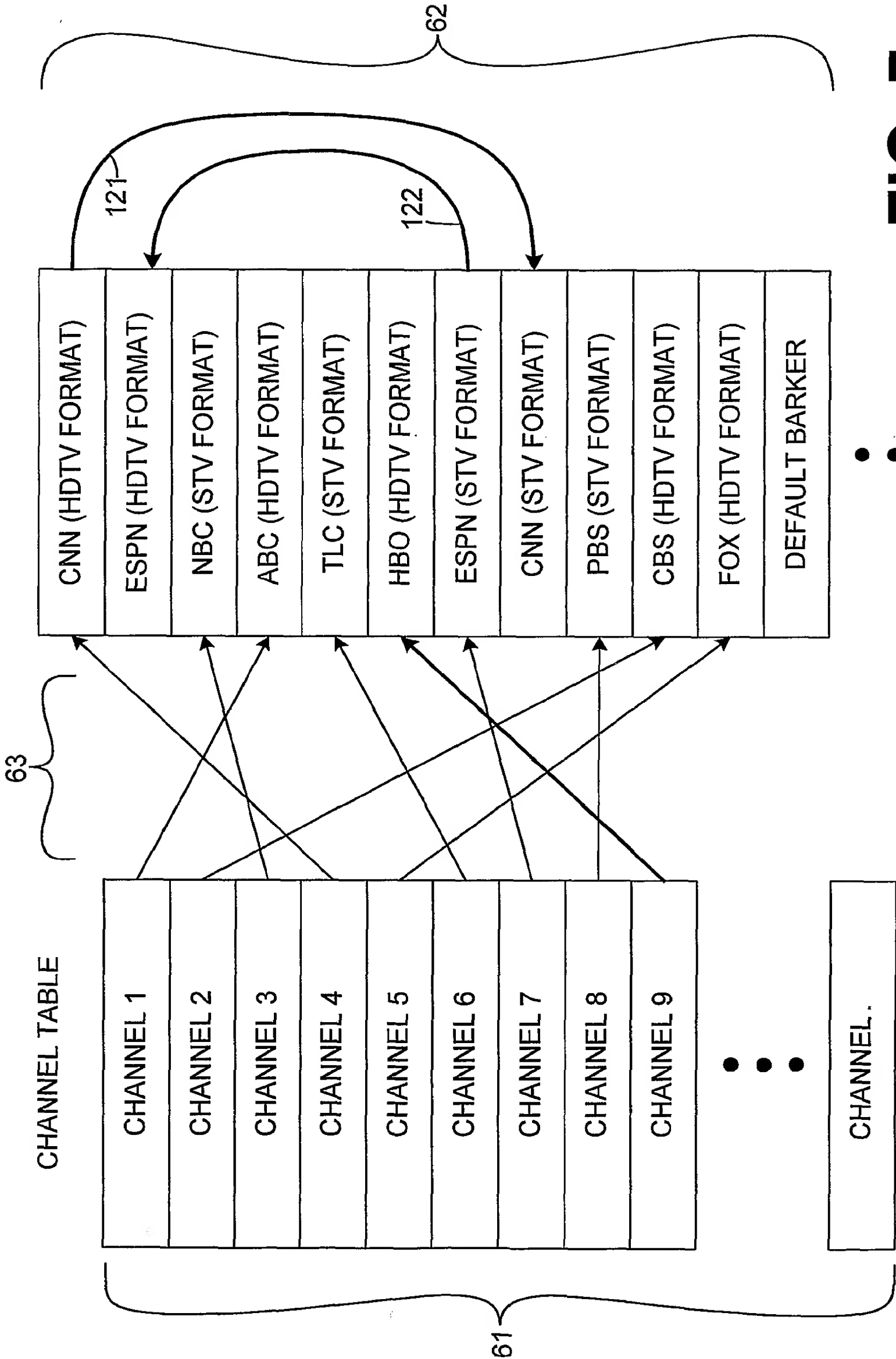


FIG. 7

(19) World Intellectual Property Organization  
International Bureau



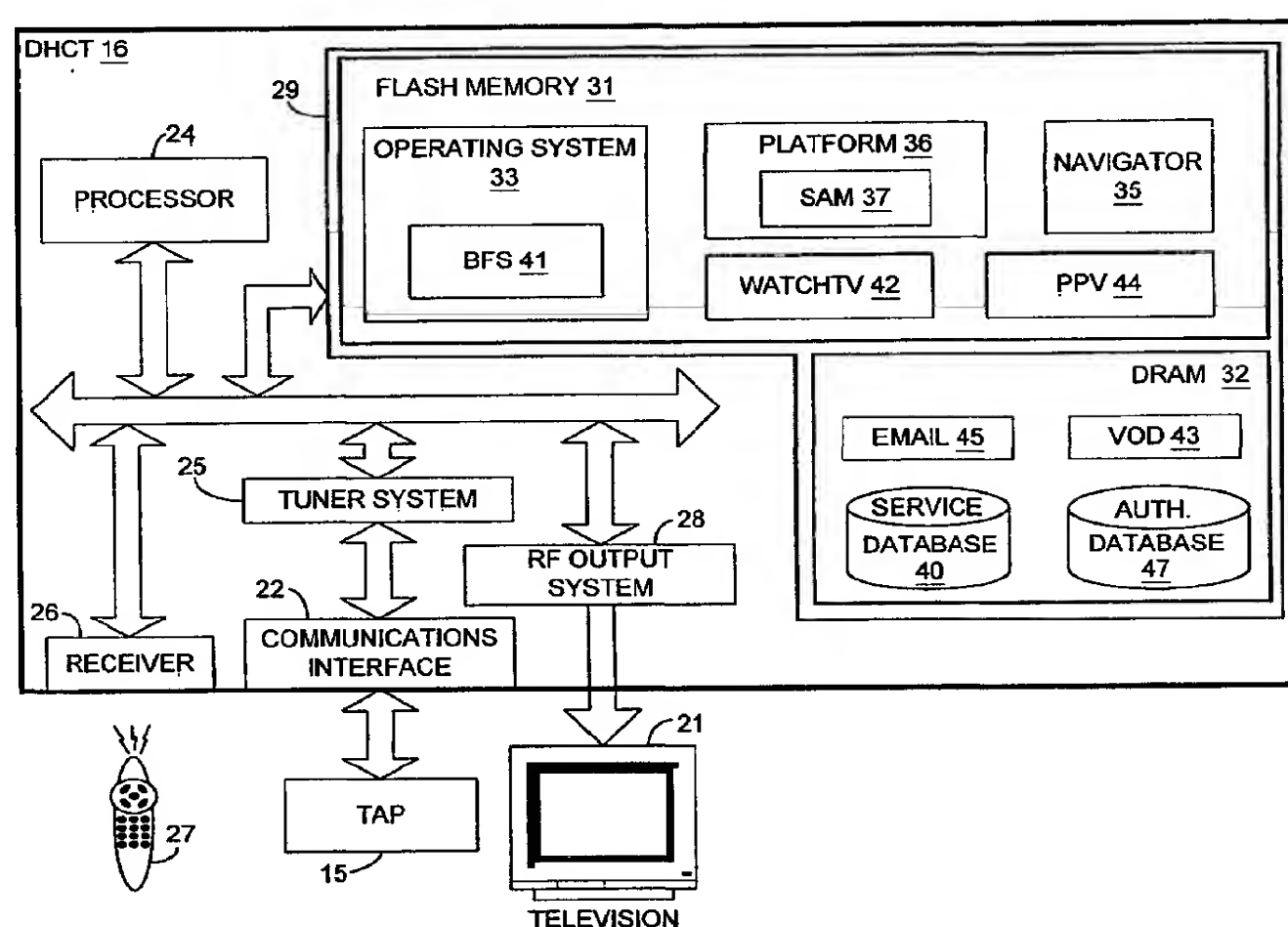
(43) International Publication Date  
11 October 2001 (11.10.2001)

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(10) International Publication Number  
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(54) Title: SYSTEM FOR PROVIDING ALTERNATIVE SERVICES



(57) Abstract: The present invention provides a system for providing alternative services in a television system. In one implementation, a subscriber is provided an alternative service upon attempting to access an unauthorized service, thereby providing a framework for efficient control of conditional access and enhanced services. In addition, in one implementation, user device limitations or variations are handled conveniently through the same multi-purpose system for providing alternative services.



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/10874

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04N7/16

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 99 52285 A (DISCOVERY COMMUNICAT INC) 14 October 1999 (1999-10-14)</p> <p>page 21, line 14 -page 25, line 14 page 43, line 22 -page 45, line 16 page 79, line 18 -page 81, line 119 page 83, line 13 -page 90, line 31 page 93, line 14 - line 25 page 103, line 3 - line 14 page 112, line 15 -page 115, line 12 page 117, line 3 -page 118, line 12 figures 7-9,12</p> <p style="text-align: center;">---</p>	<p>1-11, 14-24, 27-54</p>
A	<p>EP 0 838 915 A (MATSUSHITA ELECTRIC IND CO LTD) 29 April 1998 (1998-04-29) page 3, line 11 -page 6, line 28 figures 1-9</p> <p style="text-align: center;">---</p> <p style="text-align: center;">-/--</p>	<p>1-54</p>



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

23 November 2001

Date of mailing of the international search report

29/11/2001

Name and mailing address of the ISA

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Authorized officer

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/10874

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 96 17467 A (HERZ FREDERICK ;UNGAR LYLE (US); WACHOB DAVID (US); ZHANG JIAN (US)  6 June 1996 (1996-06-06)  page 45, line 30 -page 48, line 11  page 49, line 16 - line 29  page 74, line 16 - line 30  page 81, line 14 -page 85, line 4  figures 1-6,9,10  -----</p>	1-54

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/10874

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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